

**Research collaboration between  
Higher Education Institutions and industry  
In the South East region of England**

**Cranfield University Addendum**

**June 2005**

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*Evidence* has a range of publication and citation databases derived primarily from the databases of Thomson Scientific in Philadelphia, US. The core data are the expanded Citation Indexes from which ISI Web of Knowledge® is derived. ISI Web of Knowledge® currently covers publications from approximately 8,700 of the most prestigious, high impact research journals in the world. These are augmented by additional information on publication usage in universities derived from research and consultancy work by the company and its predecessors.

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## Executive Summary

- i. This document reports on research papers published by Cranfield University and industry with emphasis on the papers produced collaboratively between industry and the University. It is a follow-up to a report commissioned by SEEDA from *Evidence* covering collaborative publications between higher education institutes and industry based in the south east of England.
- ii. The SEEDA region covers the counties of Buckinghamshire, Oxfordshire, Berkshire, Kent, East and West Sussex, Surrey, Hampshire and the Isle of Wight. The research base is particularly strong in this region of the UK; the volume of research activity in the higher education sector within south east England is second only to that of London and the volume of the industrial R&D activity for the south east is second only to eastern England.<sup>1</sup>
- iii. Four of the five most research-active companies in the SEEDA region (total research publications 1999-2003) are involved in the pharmaceutical industry. Most of the companies fall into one of three categories: large multi-national, biomedical companies; university spin-out companies and ex-public research sector establishments.
- iv. Cranfield University is not a typical UK Higher Education institution (HEI). It has no undergraduate teaching, focussing instead on postgraduate training as one of Western Europe's largest academic centres for strategic and applied research, development and design. Income from contract research exceeds that of most other UK HEIs.
- v. The main areas of expertise, with respect to industrial collaboration, at Cranfield University are in engineering and environmental sciences (especially technologies applied to environmental monitoring). This can be seen in collaboration with the water supply industry throughout the UK in wastewater management and, more directly, with companies such as Oxford Instruments.
- vi. More than one third of collaborative publications are with water supply companies both within SEEDA and outside the region.
- vii. Unlike most other HEIs in the SEEDA region, Cranfield University does not publish much in collaboration with the pharmaceutical industry. The only example of research in this area was polymer research with GlaxoSmithKline.

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<sup>1</sup> *Evidence* Report "Research and Regions" (March 2004) for the Higher Education Policy Institute, Oxford.

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# 1 Background

*Evidence* Ltd has provided a report assessing collaborative research publications between Higher Education Institutions (HEIs) and industry in the South East region, and outside the region for the South East England Development Agency (SEEDA). This Addendum reports on the collaborative research publications between such industry and Cranfield University and should be considered in conjunction with the main report.

Cranfield University is a three-campus university based in Cranfield (Bedfordshire), Silsoe (Bedfordshire) and Shrivenham (The Royal Military College of Science, Wiltshire). None of these fall within the SEEDA region (the latter is considered to be in the South West and the Bedfordshire sites in Eastern region). This report considers all the Cranfield activity – the assignment of postcodes and industry to region remain as defined in the main report.

## Data considerations

The data presented in this report has been commissioned and designed to address specific topics requested by SEEDA. Therefore, the caveats outlined in the main report should be exercised when considering these data.

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## 2 Research activity associated with Cranfield University

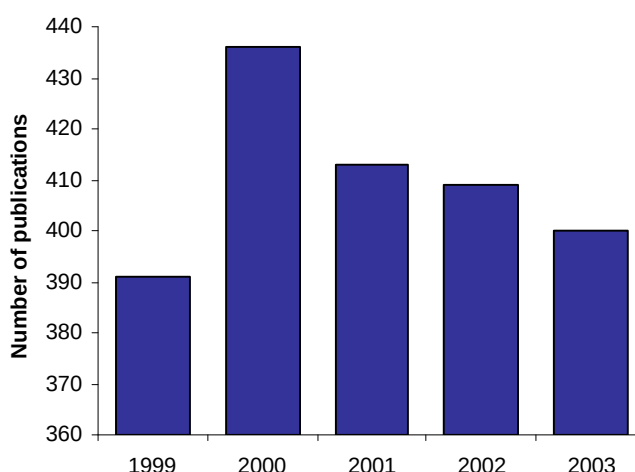
Research papers are only one form of research output and, from a company's point of view, trained people, intellectual property in the form of improvements to products and processes, and informal contact with experts may be of greater value. However, these other activities are difficult to track except via expensive surveys.

Research has shown that publication is increasingly recognised by R&D active companies as an effective mode of engagement in research networks. It is now more common among them

and signals research that is less near to market. On the other hand, culture plays a role: biotechnology tends to use journals to communicate more than does engineering which prefers conference proceedings.

Figure 2.1 shows the number of papers published by Cranfield University. By volume, it ranks 10<sup>th</sup> in this Table. The peak in 2000 is typical of UK bibliometric data owing to the increase in publication volume before the last Research Assessment Exercise (RAE 2001).

**Figure 2.1 Number of papers published by Cranfield University**



**Table 2.1 Number of papers published by HEIs within the SEEDA region (ranked by total number of papers over 5-year period)**

| HEI                                 | 5-Year Total |
|-------------------------------------|--------------|
| University of Oxford                | 28,628       |
| University of Southampton           | 11,094       |
| University of Reading               | 5,753        |
| University of Sussex                | 4,975        |
| University of Surrey                | 4,684        |
| Open University                     | 2,758        |
| Royal Holloway University of London | 2,588        |
| Brunel University                   | 2,585        |
| University of Kent                  | 2,534        |
| <b>Cranfield University</b>         | <b>2,049</b> |
| University of Portsmouth            | 1,616        |
| Oxford Brookes University           | 1,219        |
| University of Brighton              | 858          |

| HEI                                           | 5-Year Total |
|-----------------------------------------------|--------------|
| Kingston University                           | 716          |
| University of Greenwich                       | 636          |
| University of Surrey Roehampton               | 366          |
| University College Winchester (King Alfred's) | 182          |
| Canterbury Christ Church University College   | 178          |
| Southampton Institute                         | 159          |
| Buckinghamshire Chilterns University College  | 128          |
| University College Chichester                 | 98           |
| University of Buckingham                      | 61           |
| Henley Management College                     | 15           |
| Kent Institute of Art & Design                | 5            |
| Surrey Institute of Art & Design              | 5            |

Table 2.1 shows that Cranfield University has published fewer papers than most of the established 'Russell Group' and 'red brick' universities in the SEEDA region. However, the university has substantially more publications than all of the post-1990 universities except for Brunel University.

The pharmaceutical industry has published many more research papers than any other industrial sector in the South East. Other research-active companies in the SEEDA region are spin-out

companies from the University of Oxford or privatised, ex-public, research facilities and laboratories. However, Cranfield University has published very little in collaboration with the pharmaceutical industry. It works predominantly with the engineering and water supply sectors. Another area of collaboration, though less productive in absolute numbers of papers, is in computer modelling of various systems (eg energy, air flow).

### 3 Cranfield University research collaboration with SE regional industry

Table 3.1 summarises the number of collaborative papers published by SEEDA region HEIs and industry, ranked by 5-year total number of papers.

Not surprising, the University of Oxford heads this table with, on average, nearly 60 papers published per year with industry based in the South East. However, many of the companies publishing jointly

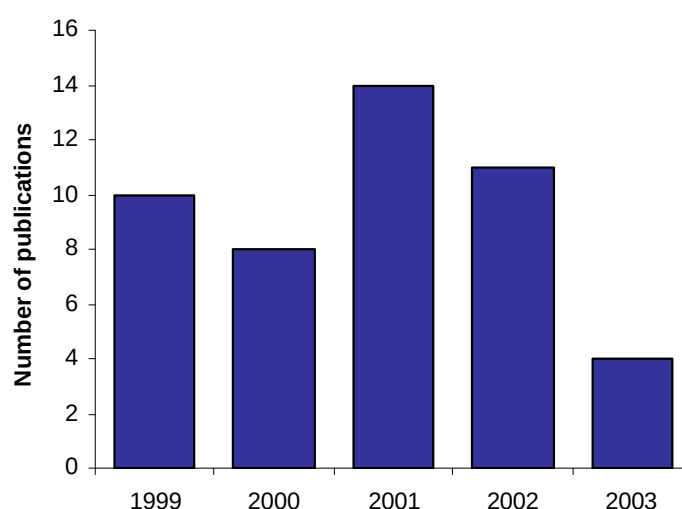
with Oxford are spin-out companies founded and run by academics associated with the university rather than established industry.

Cranfield University has produced a large number of papers in collaboration with SE regional industry in comparison with other HEIs.

**Table 3.1 Number of papers published between 1999 and 2003 by SE region HEI in collaboration with SE regional industry**

| HEI                                          | 5-Year Total |
|----------------------------------------------|--------------|
| University of Oxford                         | 293          |
| University of Southampton                    | 195          |
| University of Surrey                         | 149          |
| University of Reading                        | 96           |
| <b>Cranfield University</b>                  | <b>47</b>    |
| University of Sussex                         | 41           |
| University of Portsmouth                     | 33           |
| Royal Holloway, University of London         | 26           |
| University of Brighton                       | 24           |
| University of Kent                           | 24           |
| University of Greenwich                      | 21           |
| Open University                              | 21           |
| Brunel University                            | 19           |
| Oxford Brookes University                    | 16           |
| Kingston University                          | 6            |
| Buckinghamshire Chilterns University College | 5            |
| Southampton Institute                        | 2            |

**Figure 3.1 Number of papers published by Cranfield University with SE regional industry**



The table below details the collaborative research papers published by Cranfield University and industry within the SEEDA region. The data are disaggregated by HEI and company. The ISI subject category to which the publications have been assigned has also been identified.

## Cranfield University

The Cranfield University has published in collaboration with industry in the SEEDA region in:

- ISI subject category Chemistry; mostly with companies involved in measurement

such as AEA Technology based in and Oxford Instruments based in Oxford.

- ISI subject category Engineering; with companies including: Oxford Instruments (Oxford), Mackay Research (Sevenoaks), and Southern Water (based throughout the region).

- ISI subject category Ecology/Environment - principally with the water companies, Thames Water and Southern Water and with Montgomery Watson, based in High Wycombe.

**Table 3.2 Cranfield University collaboration with companies within SEEDA region (Top 20)**

| Company             | 1999 | 2000 | 2001 | 2002 | 2003 | 5-Year Total |
|---------------------|------|------|------|------|------|--------------|
| National Grid       | 0    | 2    | 4    | 0    | 1    | 7            |
| Thames Water        | 2    | 1    | 1    | 2    | 0    | 6            |
| Southern Water      | 1    | 1    | 0    | 1    | 1    | 4            |
| AEA Technology      | 0    | 0    | 2    | 2    | 0    | 4            |
| Oxford Instruments  | 0    | 0    | 0    | 1    | 1    | 2            |
| Mackay Research     | 0    | 1    | 1    | 0    | 0    | 2            |
| Microsoft           | 0    | 0    | 0    | 1    | 0    | 1            |
| Montgomery Watson   | 0    | 1    | 0    | 0    | 0    | 1            |
| UniSpace Kent       | 0    | 0    | 1    | 0    | 0    | 1            |
| United Biscuits     | 1    | 0    | 0    | 0    | 0    | 1            |
| WRc-NSF             | 0    | 1    | 0    | 0    | 0    | 1            |
| QinetiQ             | 0    | 0    | 0    | 0    | 1    | 1            |
| Rexam               | 0    | 0    | 0    | 1    | 0    | 1            |
| Shanks Group        | 1    | 0    | 0    | 0    | 0    | 1            |
| Sonatest            | 0    | 0    | 1    | 0    | 0    | 1            |
| Syngenta            | 0    | 0    | 0    | 1    | 0    | 1            |
| Teksolar            | 0    | 0    | 0    | 1    | 0    | 1            |
| Alcan International | 0    | 1    | 0    | 0    | 0    | 1            |
| Benetton            | 0    | 0    | 1    | 0    | 0    | 1            |
| BT                  | 1    | 0    | 0    | 0    | 0    | 1            |

## 4 Cranfield University research collaboration with industry outside the SE region

Table 4.1 summarises the total number of papers published over the 5-year period between 1999 and 2003 by industry outside the SEEDA region in collaboration with SEEDA region HEIs.

The majority of these publications are with the pharmaceutical industry – principally GlaxoSmithKline and AstraZeneca. These companies collaborate with many of the HEIs within the SEEDA region. GlaxoSmithKline has a number of sites outside the SEEDA region (in Middlesex, Stevenage and Ware in Hertfordshire)

but the company has no UK sites further north than Hertfordshire. AstraZeneca has two main sites outside the SEEDA region: at Macclesfield in Cheshire and in Loughborough.

The healthcare and homecare company Unilever, which also collaborates with many HEIs in the SEEDA region, has two main sites outside the SEEDA region: the healthcare division based at Sharnbrook in Bedfordshire and the homecare division based at Port Sunlight on the Wirral.

**Table 4.1 Number of papers published between 1999 and 2003 by SE region HEI in collaboration with industry outside the south east**

| HEI                                          | 5-Year Total |
|----------------------------------------------|--------------|
| University of Oxford                         | 461          |
| University of Southampton                    | 344          |
| University of Surrey                         | 211          |
| University of Reading                        | 115          |
| <b>Cranfield University</b>                  | <b>104</b>   |
| Brunel University                            | 87           |
| University of Sussex                         | 81           |
| University of Portsmouth                     | 55           |
| Royal Holloway, University of London         | 50           |
| Open University                              | 37           |
| University of Kent                           | 35           |
| University of Brighton                       | 30           |
| Oxford Brookes University                    | 28           |
| University of Greenwich                      | 22           |
| University of Buckingham                     | 9            |
| Kingston University                          | 8            |
| Buckinghamshire Chilterns University College | 1            |
| University of Surrey Roehampton              | 1            |

Table 4.2 below details the collaborative research papers published jointly by Cranfield University and industry outside the SEEDA region.

### Cranfield University

Cranfield University has published papers in collaboration predominantly with water supply companies outside the SEEDA region such as: Severn Trent Water, based in the East

Midlands; Anglian Water based in the East of England and Yorkshire Water based in Yorkshire and Humberside. Approximately one third of Cranfield University collaborative publications are within this sector.

A significant number of papers have also been published in collaboration with engineering companies such as Rolls Royce in Derby and British Aerospace/BAE Systems/Astrium in Bristol.

A new and distinct collaboration can be seen with the Arable Research Centres based in Biggleswade, a privatised research-institute

company specialising in soil science with 6 collaborative papers in 2003.

**Table 4.2 Cranfield University collaboration with companies outside SEEDA region (Top 20)**

| Company                        | 1999 | 2000 | 2001 | 2002 | 2003 | 5-Year Total |
|--------------------------------|------|------|------|------|------|--------------|
| Severn Trent Water             | 3    | 0    | 2    | 3    | 1    | 9            |
| Rolls Royce                    | 1    | 1    | 2    | 3    | 1    | 8            |
| Arable Research Centres (East) | 0    | 0    | 0    | 0    | 6    | 6            |
| QinetiQ                        | 0    | 0    | 0    | 3    | 2    | 5            |
| BP                             | 1    | 3    | 0    | 0    | 0    | 4            |
| GlaxoSmithKline                | 1    | 0    | 2    | 1    | 0    | 4            |
| Anglian Water                  | 0    | 1    | 1    | 1    | 0    | 3            |
| BNFL                           | 0    | 0    | 1    | 2    | 0    | 3            |
| Yorkshire Water                | 1    | 1    | 0    | 1    | 0    | 3            |
| WS Atkins                      | 0    | 0    | 0    | 1    | 1    | 2            |
| Toucan Energy Engineering      | 0    | 0    | 0    | 2    | 0    | 2            |
| Inorgtech                      | 0    | 0    | 1    | 0    | 1    | 2            |
| Land Rover                     | 0    | 0    | 0    | 0    | 2    | 2            |
| AgrEvo                         | 2    | 0    | 0    | 0    | 0    | 2            |
| British Aerospace              | 2    | 0    | 0    | 0    | 0    | 2            |
| Astrium                        | 0    | 0    | 1    | 1    | 0    | 2            |
| BAE Systems                    | 1    | 1    | 0    | 0    | 0    | 2            |
| ICI                            | 0    | 1    | 1    | 0    | 0    | 2            |
| Inco Engineered Products       | 0    | 2    | 0    | 0    | 0    | 2            |
| Crop & Water Managment Systems | 0    | 1    | 1    | 0    | 0    | 2            |
| Marconi                        | 0    | 0    | 0    | 1    | 1    | 2            |

## 5 SE regional industry research collaboration with HEIs

Table 5.1 below shows the total number of papers over the 5-year period between 1999 and 2003 published by industry based in the SEEDA region in collaboration with the UK higher education sector. The table includes the top 25 HEIs based

on total number of papers published in collaboration with SEEDA region industry and ranked by that total). Cranfield University is highlighted in bold.

**Table 5.1 Top 25 UK higher education institutions publishing in collaboration with SEEDA region industry**

| HEI                                        | 5-Year Total |
|--------------------------------------------|--------------|
| University of Oxford                       | 293          |
| Imperial College London                    | 274          |
| University College London                  | 223          |
| University of Southampton                  | 195          |
| University of Cambridge                    | 160          |
| University of Manchester (including UMIST) | 153          |
| University of Surrey                       | 149          |
| University of Sheffield                    | 137          |
| King's College London                      | 133          |
| University of Bristol                      | 96           |
| University of Reading                      | 96           |
| University of Nottingham                   | 94           |
| University of Leeds                        | 79           |
| University of Birmingham                   | 77           |
| University of Newcastle upon Tyne          | 75           |
| University of Liverpool                    | 70           |
| University of Bath                         | 66           |
| Cardiff University                         | 63           |
| University of Glasgow                      | 52           |
| University of York                         | 51           |
| University of Edinburgh                    | 49           |
| <b>Cranfield University</b>                | <b>47</b>    |
| University of Leicester                    | 41           |
| Loughborough University                    | 41           |
| University of Sussex                       | 41           |

Overall, Cranfield University publishes more collaborative papers with industry than many other HEIs within the SEEDA region. It has extensive collaborative links both within and outside the SEEDA region. Research expertise in two main areas, engineering - especially in areas relating to

processing, and chemistry/environmental science - principally in monitoring technologies is widely sought by companies throughout the UK. The following companies have all collaborated, and produced more than one research publication, with Cranfield University in the last 5 years.

## **AEA Technology**

AEA Technology is one of the UK's leading technology companies providing consultancy, technical services and products to three markets: rail, environment and portable power. Cranfield University is one of the main HE collaborators with this company with collaborative publications on ionic liquids.

## **Mackay Research**

Based in Sevenoaks, Kent this company has published in collaboration only with Cranfield University modelling UK energy consumption. The company appears to be privately owned by a member of Cranfield University staff.

## **National Grid**

The National Grid Company is a FTSE 100 company, which owns the high-voltage electricity transmission network in England and Wales. They perform their own research at the Technology and Science Laboratories in Leatherhead with other commercial sites in London and the West Midlands. They have published several papers over the 5-year period in collaboration with Cranfield University principally on detection of carcinogenic hydrocarbons in oils.

## **Oxford Instruments**

Oxford Instruments was the first spin-out company from the University of Oxford and is now an international organisation providing

instrumentation for the healthcare industry. Collaboration with Cranfield University has been in the area of optical sensors.

## **QinetiQ**

QinetiQ is a UK-wide company formed from the privatisation of activity which was supported by the Ministry of Defence specialising in the application of technology to defence and security. Much of their commercial activity is situated in the SEEDA region, at Farnborough and Gosport, the other major site in the UK is in Malvern. Interestingly, Cranfield University collaborates more with out-of-region QinetiQ (Malvern) than within-region.

## **Southern Water**

Southern Water provides water supply and wastewater treatment services across the South East of England.

## **Thames Water**

Thames Water first came into existence in 1974, when ten regional water authorities were created for England and Wales. The company was privatised, along with the rest of the industry, in 1989 and is now part of the German RWE Group. The research and development activity is centred in Reading. It has collaborated predominantly with the University of Surrey and Cranfield University.